Remarks

Reconsideration and allowance of this application are respectfully requested in light of preceding amendments and the following remarks.

Claim Status

Claims 1-25 were presented in the originally filed application. Claims 19-25 are withdrawn. Claims 1, 3-4, 6 and 10-13 are amended. Claim 2 is cancelled. Claims 1 and 3-18 are pending. No new matter was added.

Discussion

§112 Rejections

Claims 1-18 stand rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant traverses.

The Examiner suggests that claim 1 is rendered indefinite by the phrase "total salt content being less than 3/5 g/L of total salts". Applicant traverses.

Applicant has amended the language of claim 1 in order to clarify the language of the claim. With this amendment, there

is no contradiction to require that sodium- and chloride salts must not be added to a fermentation medium. Additionally, the total salt content of all salts present, including sodium and chloride salts must be less than 3.5 g/L. In this respect, the terms "sodium salts and chloride salts" and "total salt content" are clear and unambiguous in meaning. Hence, the Examiner's §112 rejection of claim 1 should be removed and the claim allowed.

The Examiner suggests that claim 3 is unclear as to what medium or step of the claimed method might incorporate the use of calcium carbonate. Applicant traverses.

Applicant has amended the language of claim 3 to read "fermentation medium" in order to clarify the language of the claim. In light of this amendment, it is now clear what medium might incorporate the use of calcium carbonate. Hence, the Examiner's §112 rejection of claim 3 should be removed and the claim allowed.

The Examiner suggests that claim 6 is unclear as to what salts of sea water are intended for use and what medium or step of the claimed method might incorporate the use of the sea water or "low salt medium". The Examiner also suggests that it is

unclear what amount of salts in the sea water is intended. Applicant traverses.

Applicant submits that the salt content for sea water is common knowledge within the art (i.e. about 3.5%) which is clearly demonstrated by the printout from Wikipedia (see attached evidence). In light of this information, it is clear what the salt content of sea water is and it is also clear the amount of salt content of sea water described in the claim. Hence, the Examiner's §112 rejection of claim 6 should be removed and the claim allowed.

The Examiner suggests that claims 10-13 are unclear due to the limitation "the low salt medium" as lacking antecedent basis. Applicant traverses.

Applicant has amended claims 1 and 10-13 to include the phrase "fermentation medium" in order to clarify the language of the claim. In light of this amendment, there is no lack of antecedent basis in claims 10-13. Hence, the Examiner's §112 rejection of claims 10-13 should be removed and the claims allowed.

§102 Rejections

Claims 1-7 and 9-16 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,340,742 (hereinafter Barclay). Applicant traverses.

To anticipate a claim under 35 U.S.C. §102(b), a single source must contain all of the elements of the claim. *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379, 231 USPQ 81, 90 (Fed. Cir. 1986); *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1574, 224 USPQ 409, 411 (Fed. Cir. 1984); *In re Marshall*, 578 F.2d 301, 304, 198 USPQ 344, 346 (C.C.P.A. 1978). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. *See Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 USPQ 1264, 1271 (Fed. Cir. 1984). Where a reference discloses less than all of the claimed elements, an Examiner may only rely on 35 U.S.C. §103. *See Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780, 227 USPQ 773, 777 (Fed. Cir. 1985).

In the currently pending application, claim 1 describes a method for cultivating microorganisms of the order *Thraustochytriales*, wherein the microorganisms are cultivated in a fermentation medium, with the total salt content being less

than 3.5 g/L of total salts, wherein the microorganisms bring forth a production of more than 10 wt% DHA per dry biomass, and wherein the fermentation medium contains no added sodium salts or chlorine salt.

In contrast, Barclay describes a process for growing various microflora in a culture medium containing non-chloride containing sodium salts. (Column 1, Line 67 - Column 2, Line 4). Looking specifically to Example 7 in Barclay, (Column 19, Lines 12-62) therein the production of a number of salt solutions are disclosed which consist of dilutions of a stock solution (M medium salts) comprising 25 g/l NaCl, 5 g/l $MgSo_4 \cdot H_2O$, 1 g/l KCl and 0.2 g/l $CaCl_2$, i.e., 31.2 grams of salt. The lowest concentration of these salt solutions is 1.5% which leads to a total salt content of 0.468 g/l. These salt solutions were added to a fermentation extract of yeast, glutamate, ammonium sulfate, glucose, metals, A-vitamins and antibiotics. 50ml of this salt supplement fermentation solution was then cultured with 1 ml of different Thaustrochytrids growing in F-1 Medium. Example 7 directly and unambiguously discloses that sodium and chloride salts were added to the fermentation medium for investigating different Thraustochytrids.

Hence, the method of amended claim 1 of the instant invention clearly differs from the teachings disclosed by Barclay. Additionally, with the amended language of claim 1, Barclay fails to disclose all of the elements of claim 1. Thus, claim 1 is not anticipated by Barclay and therefore, this rejection must fail.

In reference to claims 3-7 and 9-16, "[I]f an independent claim is not anticipated by prior art, then its dependent claims, which necessarily include the limitations of the independent claim, are not anticipated either. *Kovin Assoc. v. Extech/Exterior Technologies*, 2006 U.S. Dist. LEXIS 63250 (N.D. Ill. 2006), citing *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1296 (Fed. Cir. 2002). Thus, claims 3-7 and 9-16 are not anticipated by Barclay and should be allowed.

Claims 1-7 and 10-17 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,509,178 (hereinafter Tanaka). Applicant traverses.

Again, to anticipate a claim under 35 U.S.C. §102(b), a single source must contain all of the elements of the claim. *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379, 231 USPQ 81, 90 (Fed. Cir. 1986); *Atlas Powder Co.*

v. E.I. du Pont De Nemours & Co., 750 F.2d 1569, 1574, 224 USPQ 409, 411 (Fed. Cir. 1984); *In re Marshall*, 578 F.2d 301, 304, 198 USPQ 344, 346 (C.C.P.A. 1978). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. *See Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 USPQ 1264, 1271 (Fed. Cir. 1984). Where a reference discloses less than all of the claimed elements, an Examiner may only rely on 35 U.S.C. §103. *See Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780, 227 USPQ 773, 777 (Fed. Cir. 1985).

As stated above, independent claim 1 describes a method for cultivating microorganisms of the order *Thraustochytriales*, wherein the microorganisms are cultivated in a fermentation medium, with the total salt content being less than 3.5 g/L of total salts, wherein the microorganisms bring forth a production of more than 10 wt% DHA per dry biomass, and wherein the fermentation medium contains no added sodium salts or chlorine salt.

Tanaka, according to the Examiner, teaches the cultivation of thraustochytrids such as *Ulkenia sp.* In a fermentation medium having less than 3.5 g/L sodium and chloride salts, which would result in more than 10% DHA dry biomass. Looking to Example 2

(Column 9, Lines 1-45), the Examiner alleges that the fermentation medium described therein would merely feature 2.6 g/L sodium and chloride salts, namely 1.3 g MgCl, 1 g $NaSO_4$ and 0.3 g CaCl. However, the Examiner seems to have mistakenly overlooked the fact that for the method of the instant invention, two completely different salt conditions must be met. First, no sodium and chloride salts may be added to the fermentation medium. Second, the total content of all salts present in the fermentation medium must not exceed 3.5 g/L. The Examiner's mistake becomes clear when one realized that her calculation is simply incorrect because she omits sodium and chloride salt contents in other components of the fermentation medium (i.e. in the listed corn steep liquor and in the 10% NaOH solution for adapting the pH). Taking these sources into account, the sum of the total salts in Tanaka's Example 2 adds up to at least 7.6 g/L, which is more than double the maximum total content permitted by amended claim 1 of the instant application.

Consequently, the Examiner's allegations regarding lack of novelty and inventive step are based on a substantial misunderstanding. Hence, Tanaka fails to disclose all of the elements of claim 1. Thus, claim 1 is not anticipated by Tanaka and therefore, this rejection must fail.

In reference to claims 3-7 and 10-17, "[I]f an independent claim is not anticipated by prior art, then its dependent claims, which necessarily include the limitations of the independent claim, are not anticipated either. *Kovin Assoc. v. Extech/Exterior Technologies*, 2006 U.S. Dist. LEXIS 63250 (N.D. Ill. 2006), citing *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1296 (Fed. Cir. 2002). Thus, claims 3-7 and 10-17 are not anticipated by Tanaka and should be allowed.

Claims 1-16 and 18 stand rejected under 35 U.S.C. 102(b) as being anticipated by Appl. Microbiol. Biotechnol. 1998, vol 49, pages 72-76 (hereinafter Yokochi). Applicant traverses.

Again, independent claim 1 describes a method for cultivating microorganisms of the order *Thraustochytriales*, wherein the microorganisms are cultivated in a fermentation medium, with the total salt content being less than 3.5 g/L of total salts, wherein the microorganisms bring forth a production of more than 10 wt% DHA per dry biomass, and wherein the fermentation medium contains no added sodium salts or chlorine salt.

In contrast, Yokochi discloses studies completed on the DHA production of *Schizochytrium limacinium* strain SR21. The

authors initially investigated the dependency of cell growth of strain SR21 on the salinity of the culture medium. Their results are presented in Figure 1a which is located in the second column on page 73. Yokochi found that the strain could also grow in low salt medium, even though cell growth was much lower that in media with 50 to 200% salinity from salt water. It was for this reason that all further studies (e.g. on DHA production) were conducted with media that contained about 50% of the salt concentration of seawater. (Page 73, Column 2, "Results").

To anticipate a claim under 35 U.S.C. §102(b), a single source must contain all of the elements of the claim. *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379, 231 USPQ 81, 90 (Fed. Cir. 1986); *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1574, 224 USPQ 409, 411 (Fed. Cir. 1984); *In re Marshall*, 578 F.2d 301, 304, 198 USPQ 344, 346 (C.C.P.A. 1978). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. *See Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 USPQ 1264, 1271 (Fed. Cir. 1984). Where a reference discloses less than all of the claimed elements, an Examiner may only rely on 35 U.S.C. §103. *See*

Titanium Metals Corp. v. Banner, 778 F.2d 775, 780, 227 USPQ 773, 777 (Fed. Cir. 1985).

It is clear from the information above that Yokochi fails to show that the microorganisms used in their studies produced more that 10% DHa per dry biomass in the absences of added seawater. More specifically, the document lacks any analytical data on the DHA production of microorganisms being cultivated "without adding sodium salts and chloride salts" as is required by amended claim 1 of the instant invention.

Hence, with the amended language of claim 1, Yokochi fails to disclose all of the elements of claim 1. Thus, claim 1 is not anticipated by Yokochi and therefore, this rejection must fail.

In reference to claims 3-16 and 18, "[I]f an independent claim is not anticipated by prior art, then its dependent claims, which necessarily include the limitations of the independent claim, are not anticipated either. *Kovin Assoc. v. Extech/Exterior Technologies*, 2006 U.S. Dist. LEXIS 63250 (N.D. Ill. 2006), citing *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1296 (Fed. Cir. 2002). Thus, claims 3-16 and 18 are not anticipated by Yokochi and should be allowed.

§103 Rejections

Claims 1-18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,340,742 (hereinafter Barclay), U.S. Patent No. 6,509,178 (hereinafter Tanaka), *Appl. Microbiol. Biotechnol.* 1998, vol 49, pages 72-76 (hereinafter Yokochi) and *Botanica Marina*, 2002, col. 45, pages 50-57 (hereinafter Fan). Applicant traverses.

The above comments regarding Barclay, Tanaka and Tokochi are incorporated herein. The Examiner has rejected claims 1-18 as unpatentable under 35 U.S.C. 103 based on Barclay, Tanaka, Tokochi and Fan. In order to establish a prima facie case of obviousness under 35 U.S.C. §103(a), the reference or combination of references must teach or suggest all the elements of the claim (See MPEP 2143 below for the basic requirements of a *prima facie* case of obviousness). In this case, as shown both above and below, Barclay, Tanaka, Tokochi and Fan do not teach all the elements of claims 1-18.

As previously stated, independent claim 1 describes a method for cultivating microorganisms of the order *Thraustochytriales*, wherein the microorganisms are cultivated in a fermentation medium, with the total salt content being less than 3.5 g/L of total salts, wherein the microorganisms bring

forth a production of more than 10 wt% DHA per dry biomass, and wherein the fermentation medium contains no added sodium salts or chlorine salt.

This is in stark contrast to Fan which discloses physiological studies on the growth characteristics of subtropical mangrove thraustochydrid strains at different salinity and temperature levels. Figure 2, cited by the Examiner, specifically shows the effect of a salinity in the range of 0 to 30% on the growth of six thraustochydrid strains. The salt content in the culture medium used by Fan is based on seawater salts (i.e. the tested yeast extract-peptone-glucose seawater broths were prepared by diluting the broth with distilled water (DW) and artificial seawater (ASW) to the various described salinities). (Page 51, Column 2, "Temperature and salinity"). The authors of Fan specifically mention that isolates from Hong Kong were:

> "able to grow, thought at a much reduced rate, in a medium prepared with distilled water that contained on a minimal amount of **salts originating from the 5% v/v inoculun**".

(Page 55, Column 2). The authors also comment on these specific results by stating that:

> "The absence of growth or reduced growth in medium with a **minute quantity of sea salts** (e.g. as represented by sea salts contained in inoculum) may be largely due to ion deficiencies. Seawater contains

> many major ions (Na, Ca, K, Mg) which are essential for the growth of marine fungi."

(Page 55, Column 2). Looking again to the enclosed sheets printed from Wikipedia regarding seawater, the table on page 1 discloses that seawater contains 1.94 wt% chloride ions and 1.08 wt% sodium ions. It follows logically that the fermentation medium in Figure 2 of Fan that is declared as having a salinity of 0% cannot be completely free of sodium and chloride salts.

Looking to the instant specification, it is clear that **absolutely no sodium or chloride salts** are added to the medium used in the instant invention. The specification states that:

> **No sodium salts** are added to the low salt medium. **No chloride salts** are further added to the low salt medium according to the invention.
> According to the present invention, addition is understood to mean an addition in both dissolved and solid form. For example, the **addition of sea water**, even in the smallest amounts, would be, according to the invention, **an addition of sodium and chloride salts**. (emphasis added)

(Page 7, lines 16-20). It follows that the culture media described in Fan, including the one declared as having 0% salinity, but actually containing seawater salts originating from the 5% v/v inoculum, do not constitute embodiments falling under the scope of claim 1 of the instant invention.

The Examiner claims to have established a prima facie case of obviousness against the instant application. MPEP § 2143 "Basic Requirements of a *Prima Facie* Case of Obviousness" states:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine references teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations.

Regarding the third criterion, the court has stated that "to establish *prima facie* obviousness of a claimed invention, **all** the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Applicant contends that none of the prior art references, neither Barclay, Tanaka, Tokochi nor Fan, whether considered alone or in combination with one another, teaches, suggests, or provides a motivation for a method of cultivating microorganisms of the order *Thraustochytriales* as described in claim 1 of the instant invention.

The cultivation method of the instant invention is not obvious in light of the prior art. Looking to the art cited by the Examiner, Yokochi teaches one skilled in the art that the optimization of DHA production of specific Thraustochytrium

strains in fermentation media with 50% seawater salt content. In view of the teachings of Yokochi, the objective technical problem to be solved would seem to be the increase in biomass production and increase in the content of PUFA's.

Looking to the instant invention, this objective is solved by the fermentation method of amended claim 1, which explicitly forbids the addition of any sodium or chloride salts to the fermentation medium. None of the art cited by the Examiner, and more specifically Barclay and Fan, suggests or even motivates one skilled in the art to completely dispense with the addition of at least minor amounts of sodium and chloride salts. To the contrary, Yokochi specifically demonstrates that he strain used can be cultivated in a low salt medium, however, with a markedly reduced cell growth. Consequently, Yokochi reverts to a fermentation media with a much higher salt water content of 50% seawater in order to investigate DHA production. Hence, Yokochi actually teaches away from the inventive solution disclosed in the instant application. Therefore, the method of amended claim 1 and all claims depending thereon is not obvious in view of Yokochi.

Looking to the question of obviousness when looking at the combination of teachings of Yokochi and Fan will still not lead

one skilled in the art to the method described in amended claim 1. Even with Fan's disclosure that specific isolates of Thraustrochytrids from mangroves in Hong Kong were capable of growing in a medium of distilled water with only a minimum addition of salt derived from the 5% v/v inoculum (Page 55, Column 2), however, at a much reduced growth rate, Fan's authors also emphasize that the addition of at least minute amounts of seawater salts is "essential" (i.e. indispensable):

> All the Hong Kong isolates…(were)…able to grow, though at a much reduced rate, in a medium prepared with distilled water that contained only a minimal amount of salts originating from the 5% v/v inoculum.

(Page 55, Column 2).

> Absence of growth or reduced growth in medium with a minute quantity of sea salts (e.g. as represented by sea salts contained in inoculum) may be largely due to ion deficiencies. Seawater contains many ions (Na, Ca, K, Mg) which are essential for the growth of marine fungi."

(Page 55, Column 2, emphasis added). Simply stated, Fan clearly leads one skilled in the art away from the inventive concept of amended claim 1. Consequently, the method of amended claim 1 is also not obvious in view of the combination of Yokochi and Fan.

Looking now to the combination of Yokochi and Barclay, once again, Barclay teaches the skilled person that for cultivating Thraustochytrids for preparing fatty acids, the addition of salt to the fermentation media is indispensable. First, Barclay

teaches a specific strain that grows well at very low salt contents (*Schizochrtrium sp.* Page 31, Column 19, Lines 56-57). Second, Barclay as a whole teaches that a method for cultivating Thraustochytrids in a culture medium must comprise a chloride content of up to 3 grams. Other anions and corresponding cations, in particular the sodium content, are not restricted. (Column 25, Claim 1). The sodium content is preferably in the range of 1 to 50 g/l. (Column 25, Claim 4). It follows that Barclay cannot motivate one skilled in the art to completely abandon the addition of sodium and chloride salts to fermentation media for cultivating Thraustochytrids. Hence, the combination of Yokochi and Barclay is also unsuited to derive the method from amended claim 1 of the instant application.

The prior art reference or combination of references relied upon by the Examiner must teach or suggest all of the limitations of the claims. See *In re Zurko*, 111 F.3d 887, 888-89, 42 U.S.P.Q.2d 1467, 1478 (Fed. Cir. 1997); *In re Wilson*, 424 F.2d 1382, 1385, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art."). The teachings or suggestions, as well as the expectation of success, must come from the prior art, not applicant's disclosure. See *In re Vaeck*, 947 F.2d 488, 493, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir.

1991). In this instance, from the information detailed above, it is clear that Barclay, Tanaka, Tokochi and Fan, whether considered individually or combined, fail to teach or suggest all the limitations of Applicant's claims.

Each of the documents cited by the Examiner suffers from the same deficiencies, namely they all teach the addition of sodium and chloride salts to Thraustochytrids as an absolute necessity for culturing these microorganisms. The oil produced from microorganisms cultivated according to the instant invention is unique in that it has increased content of PUFAs when compared to oil obtained from microorganisms cultivated in conventional media. (Specification, Page 5, lines 19-26, Examples). None of the cited prior art documents motivates or suggests to the skilled person in the art to avoid addition of sodium and chloride salts in order to increase the PUFA content of microorganisms of the order Thraustochytrids. Instead, each and every one of the prior art documents teaches the addition of sodium- and chloride salts, and hence, teaches away from the solution presented by the instant invention.

The U.S. Supreme Court recently held that rigid and mandatory application of the "teaching-suggestion-motivation," or TSM, test is incompatible with its precedents. *KSR Int'l Co.*

v. Teleflex, Inc. 127 S.Ct 1727, 1741 (2007). The Court did not, however, discard the TSM test completely; it noted that its precedents show that an invention "composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *Id.*

The Court held that the TSM test must be applied flexibly, and take into account a number of factors "in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed." *Id.* at 1740-41. Despite this flexibility, however, the Court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements in the way the claimed new invention does." *Id.* "To facilitate review, this analysis should be made explicit." *Id.*

The obviousness rationale addressed in *KSR* was premised on combining elements known in the prior art. *Id.* at 1738-39. The *KSR* Court noted that obviousness cannot be proven merely by showing that the elements of a claimed device were known in the prior art; it must be shown that those of ordinary skill in the art would have had some "apparent reason to combine the known elements in the fashion claimed." *Id.* at 1741. See also *Ex parte Thomas J. Whalen II, et al*, BPAI 2007-4423 (2008). As

stated above, there is no motivation for one skilled in the art to modify Barclay, Tanaka, Tokochi or Fan to achieve the methods claimed in the instant application.

Based on *KSR v. Teleflex, Inc.* 127 S.Ct. 1727, 167 L.Ed2d 705, 2007 U.S. Lexis 4745 (2007), the obviousness question may be broken down to: Is the invention predictable based upon the prior art? *Id.* at 1740, 721.

Simply, the answer to that question is "no." Hindsight reconstruction is not permitted as the Federal Circuit has repeatedly warned that the requisite motivation to modify a reference must come from the prior art, not Applicant's specification. See *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531-32 (Fed. Cir. 1988) ("there must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant's disclosure.") Using an Applicant's disclosure as a blueprint to reconstruct the claimed invention from isolated piece of the prior art contravenes the statutory mandate of section 103 of judging obviousness at the point in time when the invention was made. See *Grain Processing Corp. v. American Maize-Prods. Co.*, 840 F.2d 902, 907, 5 U.S.P.Q.2d 1788, 1792 (Fed. Cir. 1988).

Only hindsight reconstruction based upon the instant specification would lead the Examiner to the conclusion that the claims in the instant application are rejected under §103 as unpatentable over Barclay, Tanaka, Tokochi and Fan. Accordingly, the instant rejection of claim 1 must be removed. Thus, claim 1 is not unpatentable over Barclay, Tanaka, Tokochi and Fan and should be allowed.

Regarding claims 3-18, dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious. *Hartness Int'l, Inc. v. Simplimatic Eng'g Co., 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987); In re Abele, 684 F.2d 902, 910, 214 USPQ 682, 689 (CCPA 1982); see also In re Sernaker, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed. Cir. 1983).* See also *Kovin Assoc. v. Extech/Exterior Technologies*, 2006 U.S. Dist. LEXIS 63250 (N.D. Ill. 2006), citing *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1296 (Fed. Cir. 2002). Thus, claims 3-18 are not unpatentable over Barclay, Tanaka, Tokochi and Fan and should be allowed.

Reconsideration and allowance of this application is respectfully requested.

Respectfully submitted,

Blake E. Vande Garde
Attorney for Applicant
Registration No. 58,264

Customer No. 29494
Hammer & Associates, P.C.
3125 Springbank Lane, Suite G
Charlotte, NC 28226
Telephone: 704-927-0400
Facsimile: 704-927-0485
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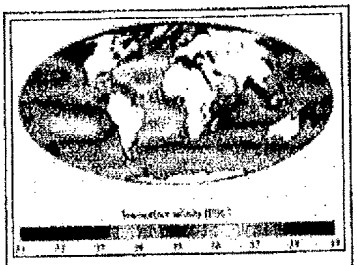
Anlage 1

Seawater

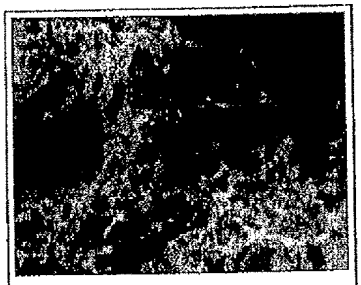
From Wikipedia, the free encyclopedia

Seawater is water from a sea or ocean. On average, seawater in the world's oceans has a salinity of ~3.5%, or 35 parts per thousand. This means that every 1 kg of seawater has approximately 35 grams of dissolved salts (mostly, but not entirely, the ions of sodium chloride: Na^+, Cl^-). The average density of seawater at the surface of the ocean is 1.025 g/mL; seawater is denser than fresh water (which reaches a maximum density of 1.000 g/mL at a temperature of 4°C) because of the added weight of the salts and electrostriction.[1]



Annual mean sea surface salinity for the World Ocean. Data from the World Ocean Atlas 2001.

Contents



Sea water in the Straits of Malacca. Taken from onboard the SuperStar Virgo

Salinity

Seawater composition (by mass)

Element	Percent	Element	Percent
Oxygen	85.84	Sulfur	0.091
Hydrogen	10.82	Calcium	0.04
Chlorine	1.94	Potassium	0.04
Sodium	1.08	Bromine	0.0067
Magnesium	0.1292	Carbon	0.0028

Although the vast majority of seawater has a salinity of between 3.1% and 3.8%, seawater is not uniformly saline throughout the world. Where mixing occurs with fresh water runoff from river mouths or near melting glaciers, seawater can be substantially less saline. The most saline open sea is the Red Sea, where high rates of evaporation, low precipitation and river inflow, and confined circulation result in the formation of unusually salty seawater. The salinity in isolated seas and salt-water lakes (for example, the Dead Sea) can be considerably greater.

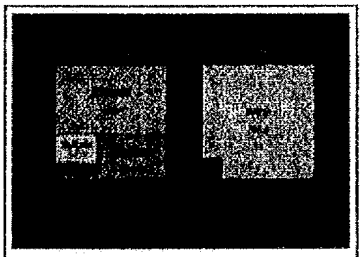
The density of surface seawater ranges from about 1020 to 1029 $kg \cdot m^{-3}$, depending on the temperature and salinity. Deep in the ocean, under high pressure, seawater can reach a density of 1050 $kg \cdot m^{-3}$ or higher. Seawater pH is limited to the range 7.5 to 8.4. The speed of sound in seawater is about 1500 $m \cdot s^{-1}$, and varies with water temperature and pressure.

Compositional differences from fresh water

Seawater is more enriched in dissolved ions of all types than fresh water.[2] However, the ratios of various solutes differ dramatically. For instance, although seawater is ~2.8 times more enriched with bicarbonate than river water based on molarity, the percentage of bicarbonate in seawater as a ratio of *all* dissolved ions is far lower than in river water; bicarbonate ions constitute 48% of river water

solutes, but only 0.41% of all seawater ions.[2][3] Differences like these are due to the varying residence times of seawater solutes; sodium and chlorine have very long residence times, while calcium (vital for carbonate formation) tends to precipitate out much more quickly.[3]

Geochemical explanations



Chemical composition of sea salt

Scientific theories behind the origins of sea salt started with Sir Edmond Halley in 1715, who proposed that salt and other minerals were carried into the sea by rivers, having been leached out of the ground by rainfall runoff. Upon reaching the ocean, these salts would be retained and concentrated as the process of evaporation (see Hydrologic cycle) removed the water. Halley noted that of the small number of lakes in the world without ocean outlets (such as the Dead Sea and the Caspian Sea, see endorheic basin), most have high salt content. Halley termed this process "continental weathering".

Total Molal Composition of Seawater (Salinity = 35)[4]

Component	Concentration (mol . kg^{-1})
H_2O	53.6
Cl^-	0.546
Na^+	0.469
Mg^{2+}	0.0528
SO_4^{2-}	0.0282
Ca^{2+}	0.0103
K^+	0.0102
C_T	0.00206
Br^-	0.000844
B_T	0.000416
Sr^{2+}	0.000091
F^-	0.000068

Halley's theory is partly correct. In addition, sodium was leached out of the ocean floor when the oceans first formed. The presence of the other dominant ion of salt, chloride, results from "outgassing" of chloride (as hydrochloric acid) with other gases from Earth's interior via volcanos and hydrothermal vents. The sodium and chloride ions subsequently became the most abundant constituents of sea salt.

Ocean salinity has been stable for billions of years, most likely as a consequence of a chemical/tectonic system which removes as much salt as is deposited; for instance, sodium and chloride sinks include evaporite deposits, pore water burial, and reactions with seafloor basalts[5] Since the ocean's creation, sodium is no longer leached out of the ocean floor, but instead is captured in sedimentary layers covering the bed of the ocean. One theory is that plate tectonics result in salt being forced under the continental land masses, where it is again slowly leached to the surface.

Potability

Even on a ship or island in the middle of the ocean, there can be a "shortage of water" meaning, of course, a shortage of fresh water. This is described famously by a line from Samuel Taylor Coleridge's *The Rime of the Ancient Mariner*:

> *"Water, water, every where*
> *Nor any drop to drink."*

Seawater can be turned into drinkable (potable) water by one of a number of desalination processes, or by diluting it with fresh water to reduce the salinity. Almost all large ocean-going vessels create

fresh water from seawater using reverse osmosis.

Otherwise, **seawater should not be drunk** because of its high salt content. In the long run, more water must be expended to eliminate the salt (through excretion in urine) than the amount of water that is gained from drinking the seawater itself. The effect of seawater intake has been studied in laboratory setting in rats. (Etzion and Yagil; Metabolic effects in rats drinking increasing concentrations of sea-water. Comp Biochem Physiol A. 1987;86(1):49-55.) [1]

Drinking seawater

Accidentally consuming small quantities of seawater is not harmful. However some people cling to a persistent and incorrect belief that humans can survive at sea by drinking only seawater. This misconception probably originated from questionable reports claiming that the French physician Alain Bombard survived an ocean crossing using only seawater and other provisions harvested from the ocean.

The amount of sodium chloride in human blood and in urine is always kept within a very narrow range of 9 g per L (0.9% weight / volume). Drinking seawater (which contains about 3.5% ions of dissolved sodium chloride) temporarily increases the concentration of sodium chloride in the blood, so the only way to excrete the excess sodium chloride in the urine is by sacrificing internal water from cells. The cells eventually give so much water to try to dilute the salt that they die from dehydration, quickly followed by organs and eventually the organism.

Survival manuals consistently advise against drinking seawater. For example, the book "Medical Aspects of Harsh Environments" (Chapter 29 - Shipboard Medicine) [2] presents a summary of 163 life raft voyages. The risk of death was 39% for those who drank seawater, compared to only 3% for those who did not drink seawater.

See also

- Thermohaline circulation
- Fresh water
- Salinity
- Sea ice
- Seawater pH
- Water

References:

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3. ^ *a b* Paul R. Pinet, *Invitation to Oceanography*, (St. Paul: West Publishing Company, 1996), pp. 126, 134-135
4. ^ http://cdiac.esd.ornl.gov/ftp/cdiac74/chapter5.pdf
5. ^ Pinet, 133.